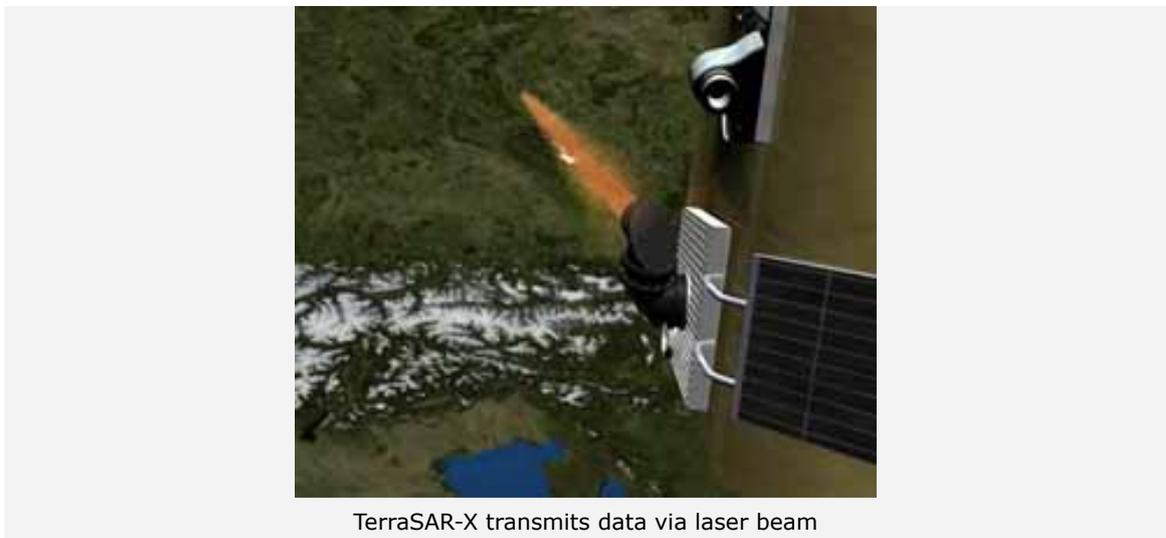


News Archive

DLR communicates with TerraSAR-X Earth Observation satellite via laser beam

10 November 2008



TerraSAR-X transmits data via laser beam

For the first time, researchers at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have succeeded in establishing communications between their optic ground station and the TerraSAR-X Earth Observation satellite. The station was able to track the satellite and receive signals from the Tesat laser terminal on the TerraSAR-X satellite. The use of laser beams would enable data transfer from Earth Observation satellites down to the surface of the Earth at speeds many times higher than those achieved at present - which would mean a big step forward in remote sensing of the Earth.

Transfer rates increased twentyfold

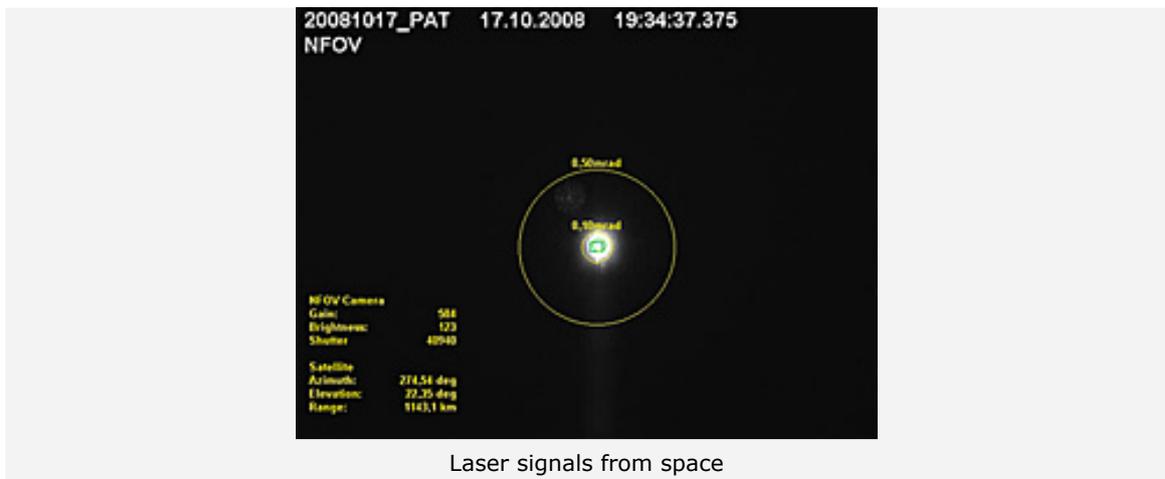
Near-Earth satellites can communicate with the ground station for about eight minutes during each pass. About two quadrillion bits can be transferred during these eight minutes, the equivalent amount of data on 70 DVDs. Data rates of 5.6 gigabits per second can be achieved over intersatellite links between so-called laser communication terminals (LCTs). This amounts to a twentyfold increase over the transfer rate achieved by state-of-the-art satellites using the microwave technology in common use today. The higher transfer rates are made possible by the substantially higher frequency of the laser light, allowing more information to be transmitted per unit of time. Moreover, only a small amount of radiant energy is needed to transmit data over long distances.



Optical ground station in Oberpfaffenhofen

This mode of data transfer does require very accurate alignment of the transmitter and the receiver, however, as the satellite moves across the sky at high speed and the laser beam received by the ground station only has a divergence of less than one thousandth of a degree. This means that the footprint of the laser beam has a diameter of just a few metres, even though the satellite is at a distance of 500 to 2 000 kilometres. In addition to this, the transmission is influenced by the weather and by atmospheric conditions. For this reason, scientists at the DLR Institute of Communications and Navigation investigated the propagation of light through the atmosphere between the satellite and the ground station. The results of this research are required for the design of future systems for data transfer from space to the surface of the Earth.

The 'LCT' on board TerraSAR-X was financed by the DLR Space Agency and built by the Tesat-Spacecom company. Using two laser communication terminals, laser communication was already established successfully between TerraSAR-X and the US satellite NFIRE (Near Field Infrared Experiment) over a distance of 5 000 kilometres in spring 2008.



Laser signals from space

The successful experiment marks the next phase in the evolution of this technology, which had already been demonstrated before in the German-Japanese KIDDO project (KIrari's Optical Downlink to Oberpfaffenhofen). In the context of this project, a laser beam transmitted by the Japanese 'OICETS' satellite (Optical Interorbit Communications Engineering Test Satellite) was 'captured' successfully using the optical ground station in Oberpfaffenhofen in June 2006. A data rate of 50 megabits per second was achieved over this downlink.

More of these experiments are planned for the future: in the context of an international measurement campaign, TerraSAR-X will communicate with ground stations in Tenerife, Oberpfaffenhofen and Tokyo. The European Space Agency ESA, the Japanese research institution NICT (National Institute of Information and Communications Technology) and the Tesat-Spacecom company will be DLR's partners in this measurement campaign.

Contact

Andreas Schütz

Deutsches Zentrum für Luft- und Raumfahrt (DLR) - German Aerospace Center
Corporate Communications, Spokesman
Tel: +49 2203 601-2474
Mobile: +49 171 3126466
Fax: +49 2203 601-3249
E-Mail: andreas.schuetz@dlr.de

Dr.-Ing. Dirk Giggenbach

German Aerospace Center
Institute of Communications and Navigation, Satellite Networks
Tel: +49 8153 28-2821
Fax: +49 8153 28-2844
E-Mail: Dirk.Giggenbach@dlr.de

Contact details for image and video enquiries as well as information regarding DLR's terms of use can be found on the DLR portal imprint.